Response to the PCT Written Opinion

(1) In the PCT Opinion dated April 13, 2004, it is stated that "The invention pertaining to claims 1-9 and 11-14 has no inventive step in light of Document 1 (JP2002-294438), Document 2 (JP63-65039) and Document 3 (US4822560, Patent Family: JP6-207232). It would be easy for one skilled in the art to apply the invention relating to a copper alloy for electrical apparatuses containing a prescribed amount of Sn, Mn, Al, Si from the perspective of soldering bondability, plating performance, conductivity, intensity, corrosion resistance and so on to the invention of a copper ally sputtering target for a semiconductor device wiring containing minute additive amounts of Si or the like for controlling the growth of crystal grains of the target."

Nevertheless, cited Documents 1-3 are all entirely different from the present invention, and do not in any way disclose or suggest the constitution, operation, effect and technical spirit of the present invention. Therefore, the present invention clearly possesses inventive step.

The reason for this is explained in detail below.

(2) Foremost, the characteristic points of the present invention are explained. As claimed in the claims, the present invention pertains to a "copper alloy sputtering target". And, a requisite condition of this copper alloy is that it "contains 0.5 to 4.0wt% of Al or Sn".

As a result of including 0.5 to 4.0wt% of Al, as described in the Description (page 5), the present invention relates to technology for yielding the operation and effect of enabling the "[formation of] a stable and uniform seed layer without any coagulation and superior in oxidation resistance upon performing copper electroplating. Further, this is superior in sputter deposition characteristics and useful as the wiring material of a semiconductor element. As a result of containing 0.5 to 4.0wt% of Al, this

alloy is able to effectively prevent the coagulation upon plating. In other words, the wettability with the barrier film can be improved. If the Al content is less than 0.5wt%, coagulation cannot be prevented, and, if it exceeds 4.0wt%, resistance at the seed layer will increase, and the resistance as the overall copper wiring will increase, which is not preferable. Further, during the dissolution in the copper alloy manufacturing process, since the oxygen content will increase together with the increase of Al, it is necessary to avoid such Al content from exceeding 4.0wt%. Particularly, it is optimal that the Al content is 1 to 2wt%."

Further, as a result of including 0.5 to 4.0wt% of Sn, as described in the Description (page 5 and page 6), the present invention relates to technology for yielding the operation and effect of enabling the "[formation of] a stable and uniform seed layer without any coagulation and superior in oxidation resistance upon performing copper electroplating. Further, this is superior in sputter deposition characteristics and useful as the wiring material of a semiconductor element. As a result of containing 0.5 to 4.0wt% of Sn, this alloy is able to effectively prevent the coagulation upon plating. In other words, the wettability with the barrier film can be improved. If the Sn content is less than 0.5wt%, coagulation cannot be prevented, and, if it exceeds 4.0wt%, resistance at the seed layer will increase, and the resistance as the overall copper wiring will increase, which is not preferable. Further, during the dissolution in the copper alloy manufacturing process, since the deformation processing of the ingot will become difficult, it is necessary to avoid such Sn content from exceeding 4.0wt%. Particularly, it is optimal that the Sn content is 1 to 3wt%."

(3) Meanwhile, upon reviewing the cited references, although Document 1 is in fact an invention related to a copper alloy sputtering target with Si included in such copper alloy, and, since the present

invention also requires Si in the copper alloy, it could be said that the two inventions are common only with respect to the point that Si is added as an additive element of the copper alloy. Nevertheless, the Si described in Document 1 is added only for the purpose of suppressing the growth of crystal grains.

Further, Document 1 does not in any way describe the inclusion of "0.5 to 4.0wt% of Al or Sn", which is the requisite condition of the present invention. And, needless to say, as a result of adding Al or Sn, the object, operation and effect such as the coagulation upon plating can be effectively prevented, the wettability with the barrier film can be improved, the oxidation resistance can be improved, and a stable and uniform seed layer can be formed and so on do not exist anywhere.

Therefore, the object, constitution, operation and effect of the present invention and Document 1 differ entirely, and the technical spirit also differs considerably. Thus, it is erroneous to say that the present invention could have been easily achieved based on Document 1.

(4) Next, although Document 2 and Document 3 are presented in order to supplement the insufficiency of Al or Sn described above, these documents are for use as the semiconductor lead member, connector member, terminal member (contact spring such as a switch or relay), and the function thereof is a copper alloy for electrical appliances requiring conductivity, intensity, plating performance and soldering performance.

In other words, as described in the Examples of Document 2, for instance, these alloys are manufactured by charcoal coating the alloy described in Table 1 with a graphite crucible in the atmosphere, dissolving and casting this, and thereafter performing rolling and heat treatment thereto. With this kind of manufacturing method, there are no means for preventing the mixing of oxygen or carbon, and the management of purity required in a sputtering target can in no way be expected.

And, this copper alloy for electrical appliances relates to technology for using the rolled sheet as is in order to provide the foregoing functions. Such technology belongs to a technical field that is entirely different from a sputtering target for forming a thin film.

In addition, with Document 2, Mg: 0.001 to 0.2wt% and P: 0.001 to 0.1wt% are contained as requisite components, and, with Document 3, Cr: 0.09 to 0.4wt% is contained as the requisite component, and, further, in the patent family (JP6-207232) of this Document 3, P: 0.1wt% or less and Zn: 1.0wt% or more and 5wt% or less are contained as requisite components.

Upon closely reviewing the reason for adding these alloy components described in Document 2 and Document 3, Mg is added for the purpose of improving the intensity, plating adhesiveness, soldering bondability and stress corrosion cracking resistance; P is added for improving the flow of molten metal, intensity and conductivity; Cr is added for improving the intensity and stress corrosion cracking resistance; and Zn is added for the purpose of preventing the embrittlement phenomenon, and improving the heat treatment performance and mechanical properties. And, all of these elements are inherent additive elements to be used as the semiconductor lead member, connector member, or terminal member (contact spring such as a switch or relay).

Nevertheless, Document 2 and Document 3 do not in any way disclose or describe the object, operation and effect of the present invention of effectively preventing the coagulation upon plating required in a copper alloy target for forming a thin film, improving the wettability with the barrier film, and forming a stable and uniform a seed layer abundant in oxidation resistance. The elements contained in Document 2 and Document 3 as requisite elements are harmful elements in the copper alloy target of the present invention which will deteriorate the

characteristics, and must not exist.

Further, Documents 1 to 3 do not disclose or suggest in any way a Cu target with Al added thereto, or other aspects of the present invention.

As described above, not only do the constitutions of the inventions differ, the purpose, object, operation and effect also differ, and it is clearly erroneous to say that the combination of Document 2 or Document 3, which relates to a different kind of technology, with Document 1 will constitute grounds for easily achieving the present invention.

(5) As described above, the present invention and the cited Documents 1 to 3 have different constituent elements, and the object, operation and effect are also entirely different, and the technical spirit is also significantly different. Therefore, it is clearly erroneous to say that the present invention could have been easily achieved based on the combination of the inventions of these Documents 1 to 3.

Accordingly, we believe that the invention of this PCT application (claims 1-9 and 11-14) possesses patentability, and look forward to receiving a judgment to such effect.